Chapter 18

Parallel texts in computer-assisted language learning

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Abstract: Parallel bilingual texts are a valuable source of information to advanced language learners, particularly in the area of lexis, subtle lexical dependencies. Typically this information is either not available or sporadically available only in very large dictionaries. To be most effective, the corpora in question should be indexed by lexeme (not string, or word form), and should be aligned into parallel sentences. This paper surveys use and prospects.

1. INTRODUCTION

This brief paper surveys the use of parallel bilingual texts in language learning. Although it contains sections on language learning and computer-assisted language learning (CALL), the focus is entirely on the potential use of parallel, bilingual texts. There is a review of the literature on the use of parallel, bilingual corpora in CALL. These sections make no pretense at comprehensiveness except with respect to the focus. The following sections of the paper report on a working prototype of a system which allowed native speakers of Dutch, intermediate-level French students, to examine *inter alia* bilingual, aligned texts as a source of information on unknown words. The students were positive about the prototype, making it worthwhile to note some issues about preparing such parallel texts for pedagogical use. The final section draws some conclusions about prospects for future work.

2. LANGUAGE LEARNING

Foreign and second language learning is studied in applied linguistics; a distinction is drawn between foreign language learning, which normally takes place in classrooms, and always remote from extensive natural opportunity to use the foreign language, and second language learning, which occurs in a "naturalistic" environment, normally in a country where the language is spoken. There are researchers who prefer the term "second language acquisition", because "acquisition" (as opposed to "learning") emphasizes the degree to which automatic processes may play a role in the more natural situation when a language from the immediate environment is adopted. The two branches of language learning share an applied focus: both consistently research not only how language learning normally proceeds, but also how it succeeds best. They seek to optimize learning, naturally with respect to the goals of language learners (e.g., scientific literature, tourism, or commerce), their (linguistic) backgrounds, and their age and educational level. Van Els et al. (1977) is an excellent reference on issues in this branch of applied linguistics. One principle on which the different schools agree is that the material to which learners are exposed must be comprehensible to the learners in order for learning to proceed optimally (Widdowson, 1990:111, citing Krashen, 1982).

Parallel texts have played a traditional role in traditional language learning even if they are not a popular object of current research interest. Parallel texts show translation near originals, and they are a reasonable guarantee that textual material will be comprehensible, in accordance with the requirement just noted. Linguistics scholars, but also school children, are fond of foreign language texts for which parallel translations are provided. An example may be evocative:

> Gallia est omnis divisa in partes tres, quarum unam incolunt Belgae,…
> Gaul is a whole divided into three parts, one of which the Belgae inhabit …
> (Caesar, *De Bello Galico*, Loeb Classical Library, Harvard)

While the largest market for such texts may well be school children cramming for exams they might better prepare for by learning Latin, the texts serve a legitimate purpose in allowing less experienced readers to approach natural, even challenging texts more quickly than they otherwise might. Sometimes parallel texts are accompanied by glosses, i.e., word-by-word translations accompanied by brief notes on the grammatical information in inflections.

> Gallia est omnis divisa in partes tres, quarum unam
> Gaul be-3sg whole divided-3fsg into parts-Acc three Rel-f-GenPl one
> Gaul is a whole divided into three parts, one of which …

The parallel texts together with glosses lay bare the grammatical patterns of a language in a way which is valuable to adult language learners. A proof of the value of parallel texts is that these texts are sold to language learners across the globe, and are appreciated by them, as evidenced by the many publishers involved : Penguin (Penguin Parallel Texts), Harvard (Loeb Classical Library), Random House (Vintage Russian Library), Reclam (Stuttgart), Mercier (Dublin), and others. There are even articles in journals on typography and graphic design devoted to the problems of bilingual texts (Walker, Edwards and Blacksell, 1996). If language technology can automate the provision of bilingual texts (in useful formats), this should be useful.

It would be wrong to conclude that current informed opinion sees parallel texts as a central element of teachers' pedagogical material, however. Quite the contrary, many language teachers (and most of those who theorize about language learning and language teaching) associate parallel texts with the pedagogical approach known as the "translation" method, which is associated with the sole reliance on translation exercises as language practice. Palmer ([1]1917, Ch.4) compares the translation method to the "direct method" and defends translation against its "modern" critics. He concludes, with other reflective experts on second-language learning, that translation is valuable as one activity within a program of foreign-language education. There is a more modern variant of the skepticism about reading which emphasizes the need to develop "communicative competence" (Widdowson, 1990: 117ff), in particular, conversational skills. There is little point in trying to find deployment for parallel texts for the purpose of improving conversational skills, skills for which more direct practice is likely to be most effective.

The practice of foreign language teaching turns out to be different from this theorizing, however, at least at advanced levels. We see the differences at two places in the curricula. First, at advanced levels of language instruction it is common to find courses in comparative structure. The University of Chicago Press publishes a series called "Contrastive Structure Series" (see Moulton, (1962) for a representative example from this series), which is aimed at informing language instruction through comparative examination of the grammar. Lohnes and Hopkins (1982) is likewise representative of research in this field, which is primarily aimed at facilitating language learning. It is clear that parallel corpora offer a wealth of benefits to students of comparative structure – roughly all those benefits that monolingual corpora offer to students of linguistic structure: access to authentic material, information about frequency and context as well as structure *sensu stricto*, and a much larger range of topics and example material than is ever found in a single, however comprehensive grammar.

Second, advanced programs of language instruction often include courses in translation as well, and these courses are motivated only partially as training for

professional translators. Here again, the field of foreign and second language learning is divided about the benefits of the activity. The ambivalence is reflected in the sorts of motivation which is cited in favor of translation as a language learning activity (Pieters: 1985). It is sometimes justified as a means for students to attain a sophisticated level of mastery which is otherwise difficult to stimulate, but translation is also cited as a means of forcing students to become aware of potential traps ("false friends", etc.) in the foreign language. Nord (1991) defends translation as a means of testing and practicing reading skills and providing "metalinguistic insights into the structural differences and similarities of two languages." Koenigs (1990:286) claims to show a correlation between writing skills and translation ability. Smith (1994) contradicts Koenigs, however, claiming to find no correlation between writing and speaking skills on the one hand, and translation on the other. Tudor (1988) sees a privileged role for translation. Recalling the distinction with which this section was introduced, that between foreign language learning and second language acquisition, Tudor suggests that translation may result in "enhanced acquisition", which results in "the initiation of […] extensive and form-sensitive L2 [second language (JN)] study, one capable of adding in both quantitative and qualitative terms to the learners' active productive abilities in the L2." The various view clarify that there is no consensus of learned opinion on this point, so we should note with interest that substantial time is spent on translation in advanced language curricula, which suggests a larger potential role for parallel texts than theorists concede, and perhaps a larger role than one might first imagine.

Let us note further that, since translation is studied as an extension to foreign language proficiency in many places, the benefits of parallel bilingual texts to translation may accrue automatically to some sorts of language-learning programs. See Fung, (this volume), Blank (this volume), and Gaussier, Hull, and Ait-Moktar (this volume) for applications of parallel text processing in translation and terminology. The emphasis of the other papers is on translation not as a language learning activity, but for its own sake, but they demonstrate how parallel text processing contributes to the quality and efficiency of translation. The benefits of improved translation may redound to language education.

A final point is worth special emphasis: there is a recognized subgroup of language learners, those learning a foreign language in order to read technical manuals and scientific literatures for whom reading skills are the primary—sometimes exclusive—goal. This very large group would, by itself, justify attention to question of providing varied, comprehensible material at low cost. The project we report on in detail below, was aimed in particular at this group for whom full communication was not a goal.

3. COMPUTER-ASSISTED LANGUAGE LEARNING

Computer-Assisted Language Learning (CALL) seeks to employ computers in order to improve language-learning techniques. CALL spans the range of activities in language pedagogy—hearing, speaking, reading, and writing—and draws from nearly all areas of information and communication technology (ICT). Even if most CALL applications are automated language exercises, exploiting hypertext, simple database and network technology, and digital audio and video, one finds many others, including ingenious applications of everyday technology such as word-processing and email. Levy (1997) surveys the surprisingly long history of CALL, reports on the field's extensive reflection on its proper relation to applied linguistics, computer science, and psychology, and presents his own astute view of its proper, technology-driven nature in the final chapters. There is no mention of opportunities for text alignment software, however. Jager, Nerbonne and van Essen (1998) explore especially the opportunities for language technology in CALL, and include several reports on CALL applications that exploit parallel texts.

3.1 Corpora and CALL

There is substantial, focused interest in using language corpora for CALL (Wichmann et al., 1997). Corpora are valued for providing access to authentic language use, unmediated by grammarians' theories, prescriptivists' tastes, pedagogy's traditions, or even lexicographers' limitations. There are moderate and extreme views on how corpora should best be utilized. The moderate view espouses the value of corpora, especially when accompanied by good search and concordancing tools, for instructors and very advanced students—those for whom unabridged dictionaries and comprehensive grammars are insufficient as sources of information on nuances of meaning, common usage, or stylistic level. Let's not attribute the extreme view to Tim Johns, but it is nonetheless associated with what Johns has dubbed 'data-driven learning', which emphasizes the role of discovery in the language classroom, facilitated by tools for corpus analysis. Johns (1991, p.2) finds that "the language learner is also, essentially, a research worker whose learning needs to be driven by access to linguistic data".

The fundamental reason to explore bilingual texts in CALL is that they grant the language learner the same access to authentic language use, only now accompanied by convenient translation into a known language. This increases the chances, of course, that the foreign-language corpus material will be comprehensible to learners, which, as noted above, is one of the prime requirements of all effective foreign-language pedagogical material (Krashen, 1982). The advantages of immediate access to genuine material thus accrue to

language learners with access to bilingual texts, but now with the added advantage of comparison to their native language. Barlow (1996) illustrates these advantages by displaying the results of searches for English reflexives, on the one hand, and the English lexeme *head*, on the other. His examples show that French reflexive patterns mirror English only partially, sometimes using reflexive pronouns (*allowed himself – s'est laisse*), but often omitting them (*buy themsleves lunch – acheter un déjeuner*), or using an impersonal construction (*enjoyed himself – l'enchanta*), or, in some cases, using wholely different lexical material (*speaking for myself – en mon nom*). The reflexive example is particulary striking in light of the extensive grammatical analyses that have been devoted to reflexive pronouns. Barlow's example suggests either that the rules put forward by such analyses fall short of providing adequate guidelines for language learners seeking full mastery of the language, or that the role of lexis is more extensive than often supposed. The example of Eng. *head* is of a sort more familiar to language learners: it is easy to find several common French equivalents, including *tête, chef*, and *directeur*, as well as to show that idiomatic uses show up frequently (*head on, keep one's head down*).

As we noted above, translation is often a course of study for advanced language learners, and Peters, Picchi, and Biagini (1966) note that as the goal of translation has shifted from formal linguistic equivalence to pragmatic equivalence, the bilingual corpus has risen in importance vis-à-vis the bilingual dictionary. The dictionary can never vie with extensive corpora in cataloguing and illustrating the sorts of correspondences found in translation. Danielsson and Ridings (1966a) report on an educational tool used in a training program for translators. It is based on Danielsson and Ridings's (1966) parallel corpora work, and it is based on one million words which are aligned at the sentence level. Students of translation benefit from the abundance of material which they use to find unusual translation equivalences.[1]

To summarize this section: a number of researchers have begun experimenting with bilingual corpora in language learning situations, and they advocate more extensive experimentation. They adduce convincing reasons why bilingual corpora supply information that would otherwise be unavailable. They note unanimously that the use of bilingual corpora only makes sense if good software is available to support the sorts of searches which instructors and students wish to conduct. At the same time, we must note that the field is very young. There is little report on actual uses of bilingual corpora by students, and the (extensive) reports by instructors may be of interest more for their contributions to comparative grammar and descriptive linguistics than for their contributions to

[1] They cite the LINGUA project (Bonhomme and Romary, 1995) and Intersect (Salkie, 1995) as the most important similar projects using multilingual parallel texts in language education. These reports were not accessible, however.

language pedagogy. There have been no attempts to evaluate the effect of the use of parallel, bilingual texts on language learning.

4. GLOSSER

Glosser applied natural language processing (NLP) to CALL.[2] As noted above, most CALL applications make little use of NLP. Because of this, the project wished to demonstrate the value of NLP technology to CALL. Software was developed to facilitate the task of reading a foreign language by providing information on words. Techniques that were applied in this project include morphological analysis, part-of-speech (POS) disambiguation, aligning bilingual corpora, World-Wide Web technology, and indexing.

The part of Glosser in focus below targeted intermediate-level, Dutch students of French. This work was part of a larger effort, in which software was also developed by other partners for English/Estonian, English/Bulgarian, English/Hungarian. This paper describes only the French-Dutch work and demonstrator. The demonstrator for the other language pairs is described in (Glosser, 1997). There is a web demonstrator available at http://www.let.rug.nl/~glosser/; its functionality is reduced to protect, in particular, the proprietary dictionary information (from Van Dale).

[2] The Glosser software was designed in cooperation with Lauri Karttunen, Xerox; Elena Paskaleva, Bulgarian Academy of Science; Gabor Prószécky, Morphologic, Tiit Roosma, University of Tartu, as well as several of their collaborators. The software reported on in the following section was developed by Duco Dokter.

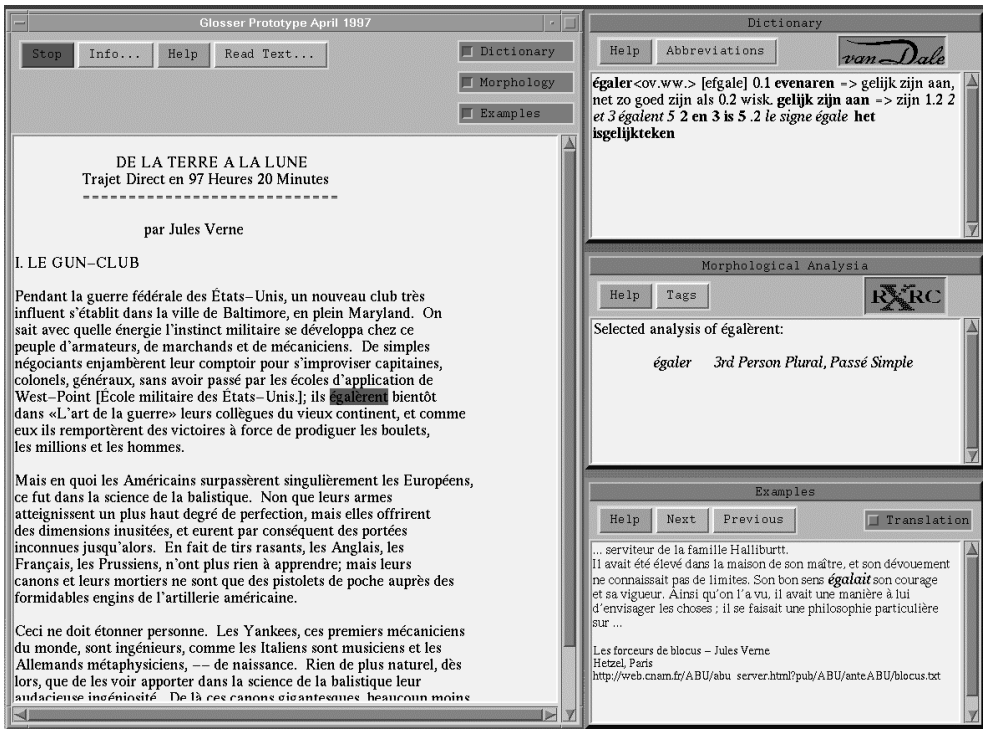

Figure 1. The user view of GLOSSER (with some translation of Dutch headings into English for this presentation). The large window on the left is a read-only browser, containing the text being read, viz., Jules Vernes's *De la terre à la lune*. The user has selected the word *égalerent*, asking for information. The smaller windows on the right show, from top to bottom, the dictionary entry for the word in the Van Dale French-Dutch dictionary; the morphological analysis, including the grammatical meaning of the inflection, namely that the word is a third-person plural passé simple form of *égaler*, and finally, in the bottom window, a further example of the word as used in another text. Note that the example is a different inflectional form.

The project foresaw two main areas where Glossser-like applications might profitably be used. First, in language learning and second, as a tool for users that have a bit of knowledge of a foreign language, but cannot read it easily or reliably. The latter group might not be trying to learn, only to cope with a specific text. A user might, for instance, need to read a software manual that contains a number of unfamiliar words. Glosser provides the user (or learner) with a means of looking up information on unfamiliar words in a straightforward and user-friendly manner.

The guiding vision behind Glosser was to recast the basic idea of the glossed text using modern means, including both restrictions and extensions. The idea was recast by using automatic morphological analysis to provide the glosses—both the grammatical information carried by the morphological inflections and the dictionary equivalent. This means that essentially *any* French text is now available with Dutch glosses, for essentially the low cost of computer processing (ignoring

the amortization of development). A further modernization of the idea has been to move the glosses to a hyper plane, so that readers control how many words are glossed. Practically, this just means that the glosses are supplied only on request.

The idea of the classical glossed text has been extended by providing other examples of word use, drawn automatically from corpora. Wherever possible, examples from bilingual corpora were offered to users. Note that the program is capable of finding alternatively inflected forms of words, just as in this example in Figure 2, in which the string *atteindra* is found based on a search for examples of *atteindre*. This dictionary entry was found based on the (inflectional) alternative *atteignissent*. This extension to the fundamental concept of glossing was intended to supplement dictionary explanation for advanced users. It has a welcome side effect, however, that we'll want to note: in dealing with highly inflected languages, such as French or Spanish, searches for the same string will be much less effective than searches for the same lemma. This is so because a single lemma, a French verb such as *atteindre*, may have hundreds of inflected forms. A further extension to the classical glossed text is that a complete morphological analysis was provided. This was done by Xerox software.

The restriction of the software that' s been accepted (vis-à-vis the older glossed texts) is that the third line---the coherent translation---is in general not available. This is not technically feasible unless a humanly prepared translation is accessible. The latter option is explored in the corpus of examples (wherever parallel bilingual corpora could be found).

The metaphor of the glossed text suggests why Glosser is successful---just as these texts have been. Simple, quick dictionary access alleviates the tedium and wasted time of dictionary lookup by hand (or by an online dictionary that isn' t integrated into a reading browser). In stating this so baldly, we are ignoring objections from occasional language teachers that dictionary lookup time is the motivating factor behind lexical learning.

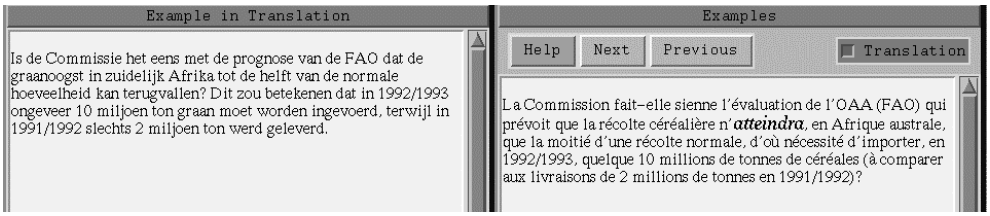

Figure 2. The windows displaying examples from bilingual, parallel corpora. In every case, the right window (French) is shown, and the left (Dutch) window showing the translation is available on demand (see button at upper right).

4.1 Technical Issues

Nerbonne and Dokter (1999) presents Glosser technically. We note here only some issues with respect to the parallel bilingual corpora. We sought texts of different sorts in order to provide a variety of examples; we attempted to vary the inflection form of examples in order to provide the student with a feeling for this variety (this would be less valuable to advanced students); and, finally, we preferred examples in bilingual texts because of the added information the translation provides.

A corpus of approximately 6.2 MB was created, including 16,701 different lexemes. Of this only 2 MB was bilingual text, because this kind of text (French-Dutch) proved difficult to obtain. A rough calculation suggests that ten times as much text would be necessary to provide examples of the approx. 30,000 entries in advanced learners'dictionaries. The bilingual texts were predominantly texts from official documents or records of the European Union, e.g. the treaty of Maastricht, and hearings before the European parliament. Some of the alignment was done with MARK ALISTeR, a tool developed by the Bulgarian Academy of Science, a project partner in Glosser (Paskaleva and Mihov, 1998). Alignment accuracy was not measured, but seemed reliable to within a sentence or two. It would have been more useful to users to have corresponding words marked where possible. The monolingual corpus was more varied, including poetry, political and commercial texts, literature etc. Early experiments showed that indexing was necessary for acceptable behavior. To allow for inflectional variety, a mapping was generated from inflected forms (in texts) to base-forms or lexemes (dictionary forms which served as basis for searches). A desirable side effect was that many more examples could be found within a fixed-size corpus. For lemmatization Xerox software Locolex was used (Bauer, Segond and Zaenen, 1995). Locolex provides part-of-speech (POS) disambiguation, morphological analysis, and lemmatization. In a prepocessing phase, the entire corpus is lemmatized, and each lexeme is written to the index file, with its POS, the file it occurs in, and the byteposition of the surface form. The byteposition of the translation is also recorded if a translation is available.

We also subjected the prototype to an analysis of errors (Nerbonne and Dokter, 1999). The most frequent error related to corpora was not finding examples, as expected. Lemmatization also regarded derivationally related forms as word variants, which is not appropriate for this application.

4.2 Users' Reactions

Nerbonne, Dokter and Smit (1998) report more completely on Glosser from a language learning perspective, including, in particular, the results of a user study in which a group of second-year French students were randomly divided into a group

using Glosser and a second one using a hand-held dictionary. Glosser users were more effective in dictionary access and also understood the text better (but the latter improvement was statistically insignificant). There was unanimity among those tested that they should prefer to continue using the program.

The users were also nearly unanimous in identifying the dictionary as the most valuable single source of information. The other facilities—morphological analysis and examples from monolingual French and bilingual French-Dutch corpora—were not appreciated to anywhere near the same extent. This may reflect the task the users were given, that of answering questions about a text they read. But all users were given opportunity to experiment with the program before actually beginning. So we might expect that user evaluation reflects the value of the information sources at least to some degree.

Besides learners' reactions, we were also interested in instructors' reactions, and, although we conducted no formal study, we presented Glosser to a number of groups of foreign language instructors. The instructors did not question the positive reactions of the students, but they viewed Glosser, with or without justification, as a better version of a dictionary—a tool for which they feel little responsibility. With few exceptions, they were unenthusiastic about incorporating Glosser or similar tools into their instruction. One often heard the reasoning that one simply cannot teach vocabulary, and that it is therefore up to students to pick it up on their own. When asked whether they thought Glosser might help in this, they answered affirmatively, but that they would leave it up to the students whether or not to use it.

4.3 Using Glosser

Although Glosser has not be used in extensive instruction of any sort, we should be interested in an experiment in which it would be used—in self-instruction or tutored, in an academic or commercial setting. Most attractive would be a group focused on reading for professional purposes.

We noted above the generally accepted principle of foreign language learning that students should practice on comprehensible material. This principle implies that texts will not be appropriate for all students, without regard to proficiency level. In general, the choice of texts to be read will be left up to the instructor. It might also be possible to make search procedures depend on learner level, using some simple measures such as percentage of vocabulary (in texts) among the most common words. This could improve the usefulness of parallel bilingual texts for language learners.

5. CONCLUSIONS

Parallel bilingual texts are a valuable source of information to advanced language learners, particularly in the area of lexis, subtle lexical dependencies. Typically this information is either not available or is sporadically available only in very large dictionaries. To be most effective, the corpora in question should be indexed by lexeme (not string, or word form), and should be aligned into parallel sentences. The best chances to provide the information to language learners may be in larger CALL systems, offering several useful sources of information.

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